



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
|-----------------|-------------|----------------------|---------------------|------------------|

10/671,934

09/29/2003

Fred Gehrung Gustavson

YOR920030331US1

8288

48150

7590

04/18/2008

MCGINN INTELLECTUAL PROPERTY LAW GROUP, PLLC

8321 OLD COURTHOUSE ROAD

SUITE 200

VIENNA, VA 22182-3817

EXAMINER

DO, CHAT C

ART UNIT

PAPER NUMBER

2193

MAIL DATE

DELIVERY MODE

04/18/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|--------------------------------------|---|--|
| Office Action Summary | Application No. 10/671,934 | Applicant(s) GUSTAVSON ET AL. | |
| | Examiner CHAT C. DO | Art Unit 2193 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11/07/07;10/24/07;01/04/08;01/08-09/08;.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,6-12,14-19 and 21-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,6-12,14-19 and 21-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>01/08/08;11/07/07;10/24/07.</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This communication is responsive to Amendment filed 01/09/2008.
2. Claims 1-3, 6-12, 14-19 and 21-23 are pending in this application. Claims are independent claims 1, 9, 14 and 19. In Amendment, claims 4-5, 13 and 20 are cancelled. This Office Action is made final.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claims 1-3, 6-12, 14-19, and 21-23 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 1-3, 6-12, 14-19, and 21-23 cite a method, apparatus, and medium for performing matrix multiplication in computer in accordance with a mathematical algorithm. However, claims 1-3, 6-12, 14-19, and 21-23 merely disclose steps/components for performing matrix multiplication in computer without further disclosing a practical/physical application. Further, the claims appear to preempt every substantial practical application of the idea embodied by the claims. In addition, claims 14-19 and 22 direct to a signal medium as clearly addressed in the specification page 26, particularly claim 19 clearly defines the signal bearing medium in the claim. Therefore, claims 1-3, 6-12, 14-19, and 21-23 are directed to non-statutory subject matter.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

6. Claims 1-3, 6-12, and 14-18 are rejected under 35 U.S.C. 102(a) as being anticipated by Vinod et al. (“A Framework for High-Performance Matrix Multiplication Based on hierarchical Abstractions, Algorithms and Optimized Low-Level Kernels”).

Re claim 1, Vinod et al. disclose in the article a method of improving at least one of speed and efficiency (e.g. paragraph right under section 2 approach in page 5) when executing a linear algebra subroutine on a computer having a memory hierarchical structure including at least one cache (e.g. summary of invention and first paragraph right after the background section 1.1 in page 2), said method comprising: determining, based on sizes, for a level 3 matrix multiplication processing, which matrix will have data for a submatrix block residing in a lower level cache of said computer and which two matrices will have data for submatrix blocks residing in at least one higher level cache or a memory (e.g. Figure 2 and section 3.2 construction in page 9-10 and section 4.2 modified recursive algorithm in pages 14-16); and streaming data from said selected two matrices, for executing said level 3 matrix multiplication processing (e.g. background section 1.1 in pages 2-3), so that said submatrix block residing in said lower level cache remains

resident in said lower level cache (e.g. last paragraph in page 5 to first paragraph in page 6; and section 3.2 construction in page 9-10).

Re claim 2, Vinod et al. further disclose in the article at lower level cache comprises an L1 cache and said higher level cache comprises an L2 cache (e.g. Figure 2).

Re claim 3, Vinod et al. further disclose in the article determining said matrix to be stored in said lower level cache comprises determining which of the three matrices has a smallest size (e.g. first paragraph in page 5 and first to second paragraphs in page 10).

Re claim 6, Vinod et al. further disclose in the article data for said second matrix and said third matrix streams into said L1 cache from said L2 cache such that said data from one of said second matrix and said third matrix streams in a vector format and data from the other of said second matrix and said third matrix streams in a vector format into said L1 cache (e.g. last two paragraphs in page 10).

Re claim 7, Vinod et al. further disclose in the article a linear algebra subroutine comprises a substitute of a subroutine from a LAPACK (Linear Algebra PACKage) (e.g. summary in page 1; first paragraph in page 5; and second paragraph in page 7).

Re claim 8, Vinod et al. further disclose in the article substitute subroutine comprises a BLAS Level 3 routine or a BLAS level 3 kernel routine (e.g. e.g. summary in page 1; first paragraph in page 5; and second paragraph in page 7).

Re claim 9, it is an apparatus claim having similar limitations cited in claim 1. Thus, claim 9 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 10, it is an apparatus claim having similar limitations cited in claim 3. Thus, claim 10 is also rejected under the same rationale as cited in the rejection of rejected claim 3.

Re claim 11, it is an apparatus claim having similar limitations cited in claim 7. Thus, claim 11 is also rejected under the same rationale as cited in the rejection of rejected claim 7.

Re claim 12, it is an apparatus claim having similar limitations cited in claim 8. Thus, claim 12 is also rejected under the same rationale as cited in the rejection of rejected claim 8.

Re claim 14, it is a medium claim having similar limitations cited in claim 1. Thus, claim 14 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 15, it is a medium claim having similar limitations cited in claim 3. Thus, claim 15 is also rejected under the same rationale as cited in the rejection of rejected claim 3.

Re claim 16, it is a medium claim having similar limitations cited in claim 7. Thus, claim 16 is also rejected under the same rationale as cited in the rejection of rejected claim 7.

Re claim 17, it is a medium claim having similar limitations cited in claim 8. Thus, claim 17 is also rejected under the same rationale as cited in the rejection of rejected claim 8.

Re claim 18, it is a medium claim having similar limitations cited in claim 6.

Thus, claim 18 is also rejected under the same rationale as cited in the rejection of rejected claim 6.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vinod et al. (“A Framework for High-Performance Matrix Multiplication Based on hierarchical Abstractions, Algorithms and Optimized Low-Level Kernels”) in view of Philip et al. (“PLAPACK: Parallel Linear Algebra Package Design Overview”).

Re claim 19, Vinod et al. disclose in Figures 1-4 a method of providing a service involving at least one of solving and applying a scientific/engineering problem (e.g. summary and background sections in pages 1-3), said method comprising at least one of: using a linear algebra software package that performs one or more matrix processing operations (e.g. paragraph right under section 1.1 background in page 2), said method comprising streaming data for matrices involved in processing said linear algebra subroutines such that data is processed using data for a first matrix stored in a cache as a matrix format and data from a second matrix and a third matrix is stored in a memory device at a higher level than said cache (e.g. construction section 3.2 and Figure 2), said

streaming providing data from said higher level in a manner as said data is required for said processing (e.g. section 2 approach in pages 5-6).

Vinod et al. fail to disclose providing a consultation for solving a scientific/engineering problem using said linear algebra software package; transmitting a result of said linear algebra software package on at least one of a network, a signal-bearing medium containing machine-readable data representing said result, and a printed version representing said result; and receiving a result of said linear algebra software package on at least one of a network, a signal-bearing medium containing machine-readable data representing said result, and a printed version representing said result. However, Philip et al. disclose a step of providing a consultation for solving a scientific/engineering problem using said linear algebra software package; transmitting a result of said linear algebra software package on at least one of a network, a signal-bearing medium containing machine-readable data representing said result, and a printed version representing said result; and receiving a result of said linear algebra software package on at least one of a network, a signal-bearing medium containing machine-readable data representing said result, and a printed version representing said result (e.g. abstract and page 1 under the instruction section wherein the library is distributed to network processors for processing).

Therefore it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add providing a consultation for solving a scientific/engineering problem using said linear algebra software package; transmitting a result of said linear algebra software package on at least one of a network, a signal-

bearing medium containing machine-readable data representing said result, and a printed version representing said result; and receiving a result of said linear algebra software package on at least one of a network, a signal-bearing medium containing machine-readable data representing said result, and a printed version representing said result as seen in Philip et al.'s invention into Vinod et al.'s invention because it would enable to perform highly and parallel computation (e.g. page 1 under the introduction section).

9. Claims 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vinod et al. ("A Framework for High-Performance Matrix Multiplication Based on hierarchical Abstractions, Algorithms and Optimized Low-Level Kernels") in view of Myszewski (U.S. 5,099,447).

Re claims 21 and 23, Vinod et al. fail to disclose in Figures 1-4 selecting, from a plurality of six kernels, two kernels optimal to use for executing said level 3 matrix multiplication processing as data streams from different levels of said M levels of cache, such that said processor switches back and forth between said two selected kernels as streaming data traverses said different levels of cache. However, Myszewski discloses in Figure 5 the step of selecting, from a plurality of six kernels, two kernels optimal to use for executing said level 3 matrix multiplication processing as data streams from different levels of said M levels of cache, such that said processor switches back and forth between said two selected kernels as streaming data traverses said different levels of cache (e.g. col. 4 lines 55-64, col. 14 lines 34-55, cols. 15-18 wherein a submatrix or block of matrix is selected and stream down to a cache for processing in order to prevent overflow cache).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add the step of selecting, from a plurality of six kernels, two kernels optimal to use for executing said level 3 matrix multiplication processing as data streams from different levels of said M levels of cache, such that said processor switches back and forth between said two selected kernels as steaming data traverses said different levels of cache as seen in Myszewski's invention into Vinod et al.'s invention because it would enable to reduce computation stalling by optimizing the instruction (e.g. abstract).

Re claim 22, it is a medium claim having similar limitations cited in claim 21. Thus, claim 22 is also rejected under the same rationale as cited in the rejection of rejected claim 21.

Response to Arguments

10. Applicant's arguments with respect to claims 1-3, 6-12, 14-19, and 21-23 have been considered but are moot in view of the new ground(s) of rejection.

a. The applicant argues in pages 11-13 for claims rejected under 35 U.S.C. 101 that claim 1 should be statutory since it is directed to a method of improving at least one of speed and efficiency when executing a linear algebra subroutine on a computer having a memory hierarchical.

The examiner respectfully submits that the feature of improving at least one of speed and efficiency when executing a linear algebra subroutine is not directly seen in the body of the claim. In generally, claim 1 discloses a method

comprising two steps: one, determining a matrix for residing in a lower cache and two matrices for residing in a higher cache; two, stream data from the two matrices. These two steps do not provide sufficient features either logically or physically to improve at least one of speed and efficiency when executing a linear algebra subroutine as alleged by the applicant.

Conclusion

Applicant's submission of an information disclosure statement under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p) on 10/24/2007 prompted the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 609.04(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chat C. Do whose telephone number is (571) 272-3721. The examiner can normally be reached on M => F from 7:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lewis Bullock can be reached on (571) 272-3759. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Chat C. Do/
Primary Examiner, Art Unit 2193

April 16, 2008

| | | | |
|---|--------------------------------|--|--|
| <i>Application Number</i>  | Application/Control No. | Applicant(s)/Patent under Reexamination | |
| | 10/671,934 | GUSTAVSON ET AL. | |
| | Examiner | Art Unit | |
| | CHAT C. DO | 2193 | |
| | | | |